

R E M A R K S

The Drawings

The drawings have been objected to under 37 C.F.R. 1.83(a) as failing to show a controller coupled to first and second monitors as required for example by claim 16. Applicants would like to call the Examiner's attention to Figure 3, which identifies a controller 310 coupled to a first monitor 314 and a second monitor 316.

As such, applicants respectfully submit that the drawings are in full compliance with Patent Office rules.

The Claims

Claims 1-23, 25 and 26 are pending in the present application; claims 1, 2, 10 and 16 are amended as described herein, and claim 24 withdrawn without prejudice per applicants' Preliminary Amendment of April 12, 20002. The foregoing claim amendments do not introduce any new matter, and are not intended to limit, restrict or otherwise preclude applicants from asserting any subsequent patent rights under the judicially recognized doctrine of equivalents.

Claim Rejections Under 35 U.S.C. § 112

Claims 1-23, 25 and 26 have been rejected under 35 U.S.C. § 112, ¶ 2, as being indefinite for failing to particularly point out and distinctly claim the subject matter of the present invention. Applicants respectfully disagree, and will now address each of the Examiner's questions in turn.

Regarding claim 1, vehicle electrical load for example can be estimated using a look-up table as shown in Figure 7. (See also Specification at p. 6, line 35 - p. 7, line 2 & p. 9, line 35 - p. 10, line 11.) The operational (or "load")

status of various vehicle electrical components is determined and the look-up table used to assign approximated load values to each of the components. (Specification at p. 10, lines 3-9.) Preferably, the load status for each component is determined using a communications protocol that allows a controller to know the operational state of the components via data messages from the components. (Specification at p. 6, lines 11-18 & p. 9, line 35 - p. 10, line 2.) Alternatively, however, the load status can be directly measured or inferred using any suitable means known in the art, including for example, current sensors, voltage sensors, etc. (Specification at p. 6, lines 11-18.)

Stored electrical energy, for example battery state-of-charge (SOC), is determined using a SOC monitor, or any other equivalent means known in the art, independently of the load status indicator. (See Specification at p. 6, lines 1-11.)

Regarding claim 2, applicants use the term "loads" to refer to the electrical demands associated with operation of certain vehicle electrical components. (See e.g. Specification at p. 9, line 35 - p. 10, line 11 & Figure 7.) The operation of the electronic cooling fan in low mode ("Electronic Cooling Fan Low") for example results in an approximate load current of 26.22 amps. (Specification at Figure 7.)

Regarding claim 3, the vehicle electrical load can be estimated using the actual ("monitored") operational status of vehicle electrical components, or according to a planned usage of the components. "Schedule of operation" refers to planned usage. (Specification at p. 7, lines 24-26 & p. 10, lines 11-12.) The schedule would allow the controller to anticipate how the vehicle load will change, and allow adjustment of the alternator output accordingly. Such a capability may be useful, for example, in the summertime when an air conditioner is being used. Based on a sudden increase in cabin or ambient

air temperature, the controller may automatically schedule the air conditioner to switch from an "AC Blower Low" mode requiring 19.28 amps to an "AC Blower High" mode requiring 34.28 amps. (See Specification at Figure 7.) Such a switch may cause a significant change in the estimated vehicle load, which the controller may want to anticipate for purposes of controlling the alternator output and battery charging.

Regarding claim 5, the term "setpoint voltage" refers to a controlled voltage output of the alternator, and not necessarily to the maximum voltage output achievable by the alternator. (Specification at Figure 2 & p. 5, lines 8-12.)

Regarding claim 6, the term "voltage regulation classification" refers to various modes of controlling the alternator output based on, for example, battery SOC and estimated vehicle electrical load. (Specification at Figure 5A.) If for example SOC is 95%, and the estimated vehicle load is 45A, then a "base" classification is selected and the alternator is controlled to operate in accordance with curve 510 of Figure 5B.

Regarding claim 7, "battery temperature" refers to the thermal energy produced by the battery as it charges and discharges. (Specification at p. 2, lines 10-24 & p. 5, lines 23-28.) No device is disclosed that actually provides external heat to the battery. Setpoint voltage regulation can depend on battery temperature as shown for example in Figures 2 and 5B.

Regarding claim 8, exemplary voltage regulation strategies are shown by curves 510-540 of Figure 5B. (Specification at p. 8, lines 9-12.) The curves define the alternator's output in accordance with the voltage regulation classifications of Figure 5A. (Specification at p. 8, lines 29-31.) A "base" classification (curve 510) may require powering of certain critical components, such as an engine

controller, lighting and safety systems, whereas a "high" classification (curve 540) may require headlamps, cooling fan and air conditioner operation. (Specification at p. 8, line 31 - p. 9, line 2.)

Regarding claim 9, the term "setpoint transition strategy" refers to a way of changing the setpoint voltage from one voltage regulation strategy to another, for example from curve 520 to curve 540 of Figure 5B. (Specification at p. 8, lines 21-24.) In such as case, for example when the battery SOC drops below 50% and the vehicle electrical load increases above 100A, then a transition signal, such as a ramping voltage function, may be used to avoid a sudden spike in the alternator output. (Specification at p. 11, lines 1-9.)

Regarding claim 16, the "first monitor" is shown in Figure 3 as Battery State of Charge Monitor 314. As known and understood by those with ordinary skill in the art, the first monitor 314 can be any suitable battery state-of-charge monitor as described for example in U.S. Patent No. 6,331,762 cited herein by the Examiner. The monitor 314 however can be any suitable means for determining battery SOC, and as appreciated by one skilled in the art, can be implemented as a combination of current sensors, voltage sensors, controllers and control algorithms and the like. (Specification at p. 6, lines 5-11.)

The second monitor 316, shown preferably as Load Status Indicator 316 in Figure 3, uses Standard Corporate Protocol (SCP) or other equivalent data communications protocol to indicate the operational status of selected vehicle electrical components. (Specification at p. 9, line 35 - p. 10, line 2.)

As shown for example in Figure 3, the electrical components generate data messages indicating their operational status, e.g., ON, OFF, LOW, HIGH, STANDBY, etc., which are communicated to controller 310. However, as with the monitor

314, the load status indicator 316 can be implemented using and known and suitable means. (Specification at p. 6, lines 11-14.)

Regarding claim 26, and as explained above with respect to claim 9, the controller in some instances must choose a transition strategy to transition the alternator output between one voltage regulation strategy to another. The transition strategy for example can be a ramping voltage function that minimizes or "smooths over" rapid changes in the alternator output. (Specification at p. 11, lines 1-9.)

Based on the foregoing, claims 1-23, 25 and 26 are believed to be in full compliance with 35 U.S.C. § 112, ¶ 2.

Claim Rejections Under 35 U.S.C. § 103(a)

Claims 1-23, 25 and 26 have been rejected under 35 U.S.C. § 103(a) as being obvious over the cited art: claims 1, 10, 16, 18, 19 and 25 have been rejected as being obvious over U.S. Patent No. 5,994,787 to Hibino in view of U.S. Patent No. 5,867,009 to Kiuchi et al.; claims 3, 4, 17 and 20 as being obvious over Hibino in view of Kiuchi et al., in further view of U.S. Patent No. 6,275,012 to Jabaji; claims 5, 6, 8, 9, 11, 12, 14, 15, 21, 22 and 26 as being obvious over Hibino in view of Kiuchi et al. and Jabaji, in further view of U.S. Patent No. 5,681,495 to Tsuchiya et al.; and claims 7, 13 and 23 as being obvious over Hibino, Kiuchi et al., Jabaji and Tsuchiya et al., in further view of U.S. Patent No. 6,018,234 to de Savasse.

For the reasons set forth below, applicants respectfully disagree and submit that the pending claims, as amended, are not rendered obvious by the cited references.

The present invention, as set forth in amended claim 1, relates to a method for operating a motor vehicle alternator

having a controllable output. The method includes the steps of monitoring an amount of stored electrical energy, estimating a vehicle electrical load, generating an alternator setpoint control signal based at least in part on the amount of electrical energy available to the vehicle and the estimated electrical load of the vehicle, using the setpoint control signal to control the alternator output so as to track the electrical load requirements of the vehicle and minimize the amount of excess electrical energy generated by the alternator. In accordance with a preferred embodiment of the invention, the alternator setpoint control signal commands the alternator to output a voltage in accordance with a plurality of voltage regulation strategies defined as a function of battery state-of-charge and vehicle electrical load.

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claim

Hibino by contrast is concerned with increasing the amount of electrical energy available to power a large vehicle load such as a defogger. (U.S. Patent No. 5,994,787 at Col. 1, lines 35-46.) To this end, Hibino discloses a control system having a switching device that enables a battery connected to the generator to be disconnected when the defogger is switched on. (U.S. Patent No. 5,994,787 at Col. 1, lines 56-59.) When activated, the switch has the effect of raising the electrical power available to the defogger so that fog and ice is removed as soon as possible. (U.S. Patent No. 5,994,787 at Col. 1, lines 59-64.) The switch, however, does not control a voltage setpoint for the purposes of tracking vehicle electrical load and thus minimizing an amount of excess electrical energy. Hibino is simply concerned with providing as much of a fixed alternator output to the load (defogger).

As such, Hibino does not disclose or suggest any of the steps required by amended claim 1, or any of the steps or elements of amended independent claims 10 and 16. Claim 10 relates to a related method, and claim 16 to a related system.

Kiuchi et al., Jabaji, Tsuchiya et al. and de Savasse also fail to teach or suggest the steps and elements of the pending claims...

Kiuchi et al. disclose a system for controlling the output of an electric generator as a function of battery SOC and vehicle speed. (U.S. Patent No. 5,867,009 at Col. 2, lines 17-24.) Kiuchi et al., however, do not disclose or even suggest the steps of estimating a vehicle load, or using such estimate to generate an alternator setpoint control signal.

Jabaji, assuming arguendo that U.S. Patent No. 6,275,012 is prior art, merely discloses an alternator having two independent output windings for generating two or more independent voltages. (U.S. Patent No. 6,275,012 at Col. 3, lines 16-26.) Tsuchiya et al. discloses an alternator power-supply type electric heating control apparatus, (U.S. Patent No. 5,681,495 at Col. 1, lines 7-15), and de Savasse a system for regulating alternator output as a function of battery temperature, (U.S. Patent No. 6,018,234 at Col. 1, lines 61-65).

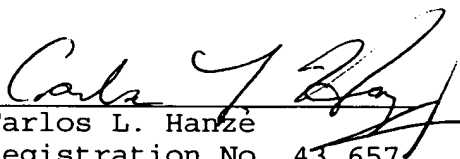
Applicants therefore submit that the present invention as set forth in pending claims is not rendered obvious by the Hibino, Kiuchi et al., Jabaji, Tsuchiya et al. and de Savasse references. None of the references, whether taken singly or in combination, even remotely suggest the claimed steps of generating an alternator setpoint control signal based at least in part on the amount of electrical energy available to the vehicle and the estimated electrical load of the vehicle, and using the setpoint control signal to control the alternator output so as to track the electrical load requirements of the vehicle and minimize the amount of excess electrical energy generated by the alternator.

Conclusion

No other art is cited in the Office Action. Based on the foregoing remarks, amended claims 1, 2, 10 and 16, and claims 3-9, 11-15, 17-23, 25 and 26 depending therefrom, are believed to be allowable over the cited art. Accordingly, the above-identified application is believed to be in condition for allowance in all respects, and such allowance is courteously solicited.

If any further amendment is necessary to advance prosecution and place this case in allowable condition, the Examiner is courteously requested to contact the undersigned by fax or telephone at the number listed below. Please charge any cost incurred in the filing of this Amendment, along with any other costs, to Deposit Account 06-1510. If there are insufficient funds in this account, please charge the fees to Deposit Account No. 06-1505.

Respectfully submitted,


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MARKED-UP VERSION TO SHOW CHANGES MADE

Claims 1, 2, 10 and 16 are amended as follows:

1. A method for operating an alternator of a motor vehicle, the alternator having a controllable output, the method comprising:

monitoring an amount of stored electrical energy available to operate the vehicle;

estimating a vehicle electrical load; [and]

[regulating an output of the alternator] generating an alternator setpoint control signal based at least in part on the amount of electrical energy available to the vehicle and the estimated electrical load of the vehicle; and

using the setpoint control signal to control the alternator output so as to track the electrical load requirements of the vehicle and minimize the amount of excess electrical energy generated by the alternator.

2. The method according to claim 1, further comprising the steps of:

monitoring operation of vehicle electrical components;
and

estimating the vehicle electrical load based on the monitored operation of the vehicle components.

10. A method for operating an alternator of a motor vehicle having a battery coupled to the alternator for storing electrical energy, the alternator having a controllable output, the method comprising:

monitoring a battery state of charge;
monitoring operation of vehicle electrical components;
estimating a vehicle electrical load based on the operation of the vehicle components; [and]

[regulating an output of the alternator] generating an alternator setpoint control signal based at least in part on

the battery state of charge and the estimated vehicle electrical load; and

using the setpoint control signal to control the alternator output so as to track the electrical load requirements of the vehicle and minimize the amount of excess electrical energy generated by the alternator.

16. A system for operating an alternator of a motor vehicle, the alternator having a controllable output, the system comprising:

a first monitor for indicating an amount of stored electrical energy available to operate the vehicle;

a second monitor for indicating operation of vehicle electrical components; and

a controller coupled to the first and second monitors for estimating a vehicle electrical load based on operation of vehicle electrical components, [and for regulating an output of the of the alternator] generating an alternator setpoint control signal based at least in part on the indicated amount of stored electrical energy and the estimated vehicle electrical load, and using the setpoint control signal to control the alternator output so as to track the electrical load requirements of the vehicle and minimize the amount of excess electrical energy generated by the alternator.